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Fought Under the Walls of Bergida: KOCOA Analysis of the Roman Attack on the Cantabrian Oppidum of Monte Bernorio (Spain)

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Abstract: As conflict archaeology has matured as a discipline, there have been calls for more unified analytical techniques. Several researchers advocate the adoption of codified analytical and planning concepts used by the United States Army. One of these concepts, KOCOA Terrain Analysis, shows promise as a locational and analytical aid in archaeological contexts. Defining terrain features are identified and categorized according to well-defined terminology, allowing for a detailed analysis of the effects of terrain on military operations. KOCOA's structure and codification render the concept transferable between researchers and diachronically across different site types. KOCOA has only rarely been utilized outside the United States and only on historical battlefields. The ongoing archaeological research at the Monte Bernorio Oppidum (Palencia, Spain) provides an opportunity to utilize KOCOA in a classical, proto-historical archaeological context.

Key words: KOCOA, Battlefield, Roman Conquest, Spain, Cantabrian Wars, Oppidum, Monte Bernorio.

"Primum adversus Cantabros sub moenibus Bergidae proeliatum. Hine statim fuga in eminentissimum Vindium montem, quo maria prius Oceani quam arma Romana ascansura esse erediderant." – Florus (2.33.49)[1]

1. Introduction

Classical sources tell us that the first great battle of the *Bellum Cantabricum et Asturicum*, known colloquially as the 'Cantabrian Wars', was fought under the walls of *Bergida* in 26 BC with the defeated survivors fleeing to distant Mount Vindius to find sanctuary (Florus 2.33.49; Orosius 6.21.5). The 'Cantabrian Wars' were a series of military campaigns waged by the nascent Roman Principate against the Cantabrian and Asturian peoples of northern Spain between 29 – 19 BC. Military operations, with the campaign of 26 – 25 BC under the personal command of the Emperor Octavian Augusts, were conducted primarily within the present Autonomous Communities of northern Castille y León (provinces of Burgos, Palencia, and León), Cantabria and Asturias (Figure 1). The Cantabrians and Asturians represented the last free peoples of the Iberian Peninsula. Classical sources state that it was the Cantabrians' frequent raiding against the neighboring Vaccaei, Turmogi and Autrigones, tribes previously brought under the control of Rome, that was responsible for the conflict (Florus 2.33.47; Orosius 6.21.3). Some modern scholars dispute this justification arguing that gaining control over the vast mineral wealth of the region, perhaps as a means for Augustus to finance further conquests and building projects, was the primary inducement for going to war (Curchin 1991: 52; Varga 2015: 72). Augustus had recently successfully concluded a costly civil war and the prosecution of a foreign war as a means of unifying and consolidating power within the new Principate must also be considered. The location of *Bergida* is not known with certainty, but the site has become most commonly associated with the Iron Age *oppidum* of Monte Bernorio (Peralta Labrador 2003: 264-265, 315-319; Torres-Martínez 2004: 79; Torres-Martínez, Fernández-Götz and Sobremazas 2016: 167-170). In fact, in the last two decades archaeology has uncovered an increasing amount of archaeological data related to the Roman conquest of northern Spain (see overview in Camino, Peralta Labrador and Torres-Martínez 2015).

[1] *"The first battle against the Cantabrians was fought under the walls of Bergida. From here they fled to the lofty peak of Mount Vindius, to which they had thought the Roman army was less likely to ascend than the waters of the Ocean."* Florus (2.33.49)

The *oppidum* of Monte Bernorio (Villarén, Pomar de Valdiva, Province of Palencia) is one the largest and most significant Iron Age fortified sites in the Iberian Peninsula (see summary in Torres-Martínez *et al.* 2016). The settlement occupied the relatively flat summit and lower terraces of Bernorio Mountain, an oval-shaped limestone mound 1,173 meters high. At the end of the Iron Age, the top of the mountain was fortified by a wall-and-fill rampart, augmented in some areas with a substantial V-shaped ditch that encloses a 28 ha area. Moreover, the lower terraces were encircled by an impressive multivallate, discontinuous system of earthworks that raises the total fortified area to approximately 90 ha. Monte Bernorio is centrally located in the southern foothills of the Cantabrian Mountains, of northern Spain, in an area of transition to the Northern Inner Plateau (*Meseta*) of the Iberian Peninsula. The site occupies a strategic position overlooking an important intersection of natural transportation routes. These routes allow north-south communication between the *Meseta* and the Bay of Biscay along an axis of advance Syme (1970) analyzed in his work on the Cantabrian Wars. The east-west route connects the provinces of Asturias and Galicia in the west to the Pyrenees and Mediterranean, through the Ebro Valley, to the east. Archaeological excavations carried out over the years have revealed that the indigenous Iron Age occupation of Monte Bernorio ended in a clash with a Roman army, which subsequently erected their own fortifications on the summit, at a time dated to the Cantabrian Wars (Torres-Martínez *et al.* 2016: 376-379; Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 529; Torres-Martínez 2004: 92).

Since 2004, the *Instituto Monte Bernorio de Estudios de la Antiguedad del Cantábrico* (IMBEAC) has conducted a series of excavations and surveys at Monte Bernorio. This fieldwork has provided a wealth of new information regarding the *oppidum* and offers an opportunity to test new analytical techniques that can be used to study ancient conflict. As Conflict Archaeology has grown as a discipline, there have been calls for the adoption of analytical concepts from the United States military to aid in the understanding of the vast quantities of data that are being accumulated (Babits 2014; Bleed and Scott 2011; Scott and McFeaters 2010). One of these, KOCOA terrain analysis shows promise as a locational and analytical tool for assessing how terrain features influenced battle. KOCOA can provide a predictive model of what was likely to have happened given the military doctrine of the combatants. This model can then be tested against the archaeological and historical record. As a codified analytical concept, KOCOA is transferable among researchers and site categories making it an excellent tool for conflict archaeology. KOCOA has been used for a number of years in the United States on historical battlefields, and has recently been applied in the United

Kingdom (McNutt 2014), but it is applicable to prehistoric battles as well (Brown forthcoming).

2. KOCOA Terrain Analysis: History and Methodology

KOCOA is an acronym that originated within the United States Army as a mnemonic used to describe a military terrain analysis system that classifies terrain characteristics relative to mission objective (Babits 2011; 2014: 263). The letters constituting the KOCOA acronym denote: **K**ey or Decisive Terrain; **O**bstacles; **C**over and Concealment; **O**bservation and Fields of Fire; and **A**venues of Approach (U.S. Army 1994: 2-10; 2007: 5-10; 2008: 5-6). Also contained within the terrain analysis, though not implicitly stated as part of the acronym, are climate variables such as weather, light and tides. The definitions of these terms are summarized in Table 1 and are discussed in detail below (U.S. Army 1994: 2-9, 2-23; 2007: 5-13; 2008: 5-6).

KOCOA analysis is one module within a suite of analyses used to plan tactical operations making it an essential component within the Intelligence Preparation of the Battlefield (IPB) process (U.S. Army 1994: 2-8; ROTC 2002a: 248). In order to accomplish this analysis the Army has adopted another acronym: METT-TC, where the constituent letters denote: **M**ission; **E**nemy; **T**errain and Weather; **T**roops and Support Available; **T**ime; and **C**ivil Considerations (U.S. Army 2007: 5-8 – 5-15). KOCOA comprises the Terrain and Weather analysis, the first 'T' of METT-TC. A proper estimation of the effects of terrain and weather relative to the objective, for not only friendly troops, but those of the enemy in anticipating possible courses of action, is critical for mission success. KOCOA analysis "can be very important even after a battle is over because combat action can significantly alter the terrain, requiring an update of the previous terrain analysis" (ROTC 2002a: 248). Post-battle terrain analysis will also aid in the evaluation of unit performance.

As part of the United States Army's troop leading procedures, KOCOA is taught at the most basic unit levels, that of platoon and squad leader (U.S. Army 1986: 2-1; ROTC 2002a: 248; Babits 2014: 263). At these levels, personal ground reconnaissance is preferred, but often unobtainable leaving the platoon and squad leaders to rely upon maps. When the operational order is received from battalion and company command, the unit objective and unit area of operations will be given. It is then incumbent upon the platoon or squad leader to conduct a

KOCOA analysis in order to familiarize themselves with the terrain and weather variables within their area of operations. This will not only allow the platoon or squad leader to make the best use of the terrain and anticipate enemy courses of action, but will also allow for enhanced understanding of the overall commander's intent and the activity of other units operating within the larger area of operations. KOCOA is covered in several Army field manuals and Reserve Officer Training Corps (ROTC) courses (U.S. Army 1986; 1994; 2001; 2007; 2008; ROTC 2002a; 2002b). This ensures a standard codification of KOCOA that is easily replicated from one generation of officers to the next. Although periodically updated, the texts are readily available in libraries and on the internet. This ease of access, standardization and replicability make KOCOA attractive as a conceptual framework for conflict archaeologists (Bleed and Scott 2011; Scott and McFeaters 2010).

The use of KOCOA in the historical sciences emerged following World War II as an instructional aide for U.S. Army War College staff rides at historic battlefields (McMasters 2011). In 1991, the Secretary of the Interior gave the initial impetus to the creation of the American Battlefield Protection Program (ABPP). It was not until 1996, however, when Congress signed into law the American Battlefield Protection Act that the ABPP received funding and official sanction (ABPP 2016). The year 1996 also saw the first use of KOCOA analysis as a cultural resource tool at Gettysburg National Military Park (McMasters 2011). In 2000, David W. Lowe compiled the ABPP's *Battlefield Survey*, a manual marking the first real attempt at establishing a replicable survey process utilizing KOCOA in an archaeological context (Lowe 2000). In 2004, KOCOA became a formal requirement of battlefield surveys funded by the ABPP (McMasters 2011; Sivilich 2014). Since its creation in 1996, the ABPP has funded the survey of over 650 battlefields spanning 16 wars (ABPP 2016). The requirement to adhere to the survey methodology outlined by Lowe means that the vast majority of these surveys utilize KOCOA in varying degrees. In this capacity, KOCOA is used to delineate battlefield boundaries and identify defining battlefield features for preservation planning purposes (McMasters 2011).

The way in which the ABPP utilizes KOCOA has drawn some criticism from conflict archaeologists as reducing KOCOA to a mere locational and categorization aide (Sivilich 2014:2). This study proposes to use KOCOA in a way similar to the U. S. Army, from which it is derived, by examining landscape features through the lens of the military doctrines employed by the combatants. Monte Bernorio is a large site and the archaeological investigations have revealed a relatively small percentage of the *oppidum*, rendering a

reconstruction of the entire settlement unfeasible. However, the landscape likely retains enough of its appearance to make a general KOCOA analysis worthwhile. The results will then be checked against the archaeological record to arrive at a plausible general battle reconstruction.

3. Roman and Cantabrian Way of War

Roman

The Roman legions emerged from the Civil War as an effective and seasoned army. The legionary troops were armed with *pila* and spears, swords (*gladius*) and daggers, and protected with coat of mail, helmet and *scutum*. Another characteristic element of their personal equipment, among the most numerous finds in the archaeology of the Cantabrian Wars, are the *caligae* (sandal nails). They were professional soldiers trained to fight in many kinds of legionary formations and manoeuvres. The art of warfare in the Roman world, and in particular siege operations, is a topic widely discussed in numerous works and exceeds the scope of this article. As a reference for Roman siege warfare, the works of Campbell (2006) and Campbell and Tritle (2013) are recommended. In the present analysis of the Roman assault on the *oppidum* of Monte Bernorio, there are two questions that need to be addressed. On the one hand, what are the different ways in which a city or town could be taken, and on the other, what can the archaeology of the Cantabrian Wars tell us about the tactics employed to this aim?

Three basic ways to take a city are distinguished in Roman times (Guillén 1994: 579-589):

1. *Obsidio*. Consists of blocking and defeating the city by depletion of resources.
2. *Oppugnatio repentina*. Consists of attack or conquest of the city by arms.
3. *Oppugnatio longinqua*. Consists of a long attack or siege.

The Roman army undertook several sieges and assaults on indigenous settlements during the Cantabrian Wars. In those, different techniques of siege and assault have been documented. Relative to the study of Monte Bernorio, the siege of La Loma (Santibáñez de la Peña, Palencia) (Peralta 2015), the siege of La Espina del Gallego (Corvera de Toranzo, Anievas y Arenas de Iguña, Cantabria) (Peralta 2002), the siege to Peña Dulla (Merindad de Sotoscueva, Burgos) and the assault on Ornedo-Santa Marina (Fernández *et al.* 2015) are especially interesting. Different excavations and surveys carried out in these places, have documented the use of *opugnatio* and *obsidio* by the Roman army, although for this campaign, as shown in La Loma,

the most common way to assault an oppidum was de *oppugnatio longinqua*. These surveys have also documented the majority use of light artillery, mainly the *scorpio*, for shooting large arrows (*tella*), and archery (Fernández Ibáñez 2015). They have also found three round stone projectiles (*globus obsidionalis*) of small calibre in Monte Bernorio (Torres-Martínez *et al.* 2012: 531-533) and another three of larger calibre, one in the siege of La Loma (Peralta 2015: 95) and two on the battlefield of La Puerta de Quintanilla (Bohigas *et al.* 2015: 194). As a result, we have to consider that the round stone projectiles were less used than the archery. Only a single Roman lead slingshot has been found in all of Cantabria, outside the Roman camp at Campo de Las Cercas (Puente Viesgo-San Felices de Buelna, Cantabria) (Peralta 2007: 497). It can be hypothesized that the Roman Army preferred archery for tactical use over slingers.

Cantabrian

At the end of the Iron Age, the Cantabri were using similar weapons that of other peoples in the so-called 'Celtic' world, and not so different from the weapons in use in the Mediterranean area. They carried spears, javelins, swords and daggers for attack, and helmets, coat of mail and leather breastplates (*cotas de malla*), shields and *scutum* for their personal protection. The archaeological record at Monte Bernorio, La Loma, and other indigenous settlements shows us that the most common weaponry used by de Cantabrians was spears and javelins (Torres- Martínez 2011: 385-442).

When fighting on the defensive, the Cantabrians' most useful weapons to repulse the attacker were spears and javelins thrown from behind the protection offered by their shields. However, the using of spears and javelins in the defence of a position implies an enormous loss of material that they could not afford. For this reason, Cantabrians tried to solve the problem of ammunition shortage for defence by using cobbles (river stones). At Monte Bernorio, hundreds of cobbles were recovered inside of the wall as well as outside. The use of rounded stone cobbles for the defence can also be seen in La Loma and, more clearly, in the siege of Puerta de Quintanilla, where there are hundreds of them just in front of the indigenous defence. Simple but effective, this cheap resource allowed defenders a high number of shot and improved the defence. There is no archaeological evidence to confirm that the Cantabrians, in contrast to other indigenous populations in Iberia, used the sling during this period.

By the Late Iron Age, Cantabrian soldiers, both as *auxiliaries* and mercenary troops, had taken part in the Roman Civil Wars and had fought against the Romans in other conflicts,

such as the Vaccei or Aquitanians Wars (Torres-Martínez 2011: 439-441). The Cantabri were familiar with the tactics, weapons and ways of Roman siege warfare, and with effective ways of defending fortified positions like the Monte Bernorio *oppidum*. In addition, the Cantabri had become skilled at designing the defences around their fortified cities and in the careful management of vital resources during siege combat. The preferred strategy of the indigenous communities was to take refuge in these fortified places, from where they were able engage in a war of attrition, exerting pressure, both from within and outside. However, Cassius Dio (53.55.6) also records that the Cantabri often occupied high ground and set ambushes in woodlands along the Roman advance. Clearly, then, the Cantabri were not adverse to engaging the Roman Army outside of their hillforts when they believed it was to their advantage to do so.

4. Cantabrian Wars Historical Background

The *Bellum Cantabricum et Asturicum* was launched by the Roman emperor Octavian Augustus in 29 BC against the Asturian and Cantabrian communities of the northern fringe of Iberia (González-Echegaray 1999). Initial military operations began with a campaign lead by General *Statilius Taurus* against the *Vaccei*, the *Astures*, and the *Cantabri* (Cassius Dio 51.20). Sustained military operations commenced in 26 BC, when Augustus himself moved to *Segisama* (Sasamón), in the modern province of Burgos, to supervise the war operations (Strabo 6.4.2; Florus 1.33.5). This campaign is better detailed in classical literature and, by combining literary and archaeological sources, it is possible to recreate the beginning of the military offensive against the southern territories of the *Cantabri*. Florus (2.33.48) and Orosius (6.21.1-11) record that the offensive advanced northwards from the Roman base camp at *Segisama* under the personal command of Augustus. The Emperor divided his estimated 50,000 men, comprised of 8 legions and auxiliaries, into three columns, to approach the central territory of the *Cantabri* on three fronts.

The Romans probably preferred to force a direct confrontation on the field, which would quickly decide the outcome of the war and allow the army to attack and destroy the enemy's hillforts, one by one. Several important indigenous centres on the route from *Segisama* towards the natural passes through the Cantabrian Mountains are known to have suffered violent destruction (González-Echegaray 1999: 161-165; Peralta Labrador 2003: 261-264, 2009, 2015; Syme 1970: 92-97; Torres-Martínez 2015: 112-115). The years 26/25 BC proved

to be crucial for the prosecution of the war, with major Roman victories at the battles of *Bergida*, in the territory of the *Cantabri*, and *Lancia*, in the lands of the *Astures*. Following these victories, the Roman army advanced through the mountain passes, while a fleet sent from Gaul operated along the coast in the Bay of Biscay. Major operations were completed by 19 BC under the command of general Agrippa (Florus 2.33; Cassius Dio 53.25, 53.29, 54.5, 54.2-5; Orosius 6.21.1-11). However, the situation remained unstable, as evidenced by some minor rebellions that took place until 16 BC and by the presence of two legions (*Legio X Gemina* and *Legio IV Macedonica*) which the Romans stationed in the territory for several decades thereafter.

5. The Battlefield of Monte Bernorio

Monte Bernorio controlled the southern approach to the central pass crossing through the Cantabrian Mountains. The *oppidum* acted as a gateway to the northern territory of the Cantabri and was likely to have been one of the Cantabri's more powerful strongholds. The attack and conquest of the Monte Bernorio *oppidum* was crucial to the development of Roman offensive operations (Fernández-Götz *et al.* 2018; Torres-Martínez 2015).

The summit of Monte Bernorio is a relatively flat, 28ha kidney-shaped plateau referred to as the "Acropolis" in excavation reports (Torres-Martínez 2004: 80). The "Acropolis" is ringed by a wall-and-fill rampart measuring 1700 m in length. The wall was constructed using irregular medium-sized blocks of limestone quarried from the mountain itself. The outer face was laid directly on the bedrock at the edge of the slope with the blocks dressed to present a smooth, homogenous appearance. The inner face was constructed on a foundation of large blocks set on another level of bedrock, so that it stood slightly higher on the terrace. The space between these two wall faces was then filled with an aggregation of earth, rubble and refuse. The completed rampart averaged 3 meters in thickness (Torres-Martínez *et al.* 2016: 365-366; Torres-Martínez, Martínez Velasco and Serna 2013: 22-29; Torres-Martínez and Serna Gancedo 2010: 78-79). This wall is estimated to have stood 5 meters in height and may have been topped with a wooden palisade or roofed platform (Torres-Martínez and Serna Gancedo 2010: 79) (Figure 2).

The Acropolis wall had three gateways that provided access to the interior of the site (Torres-Martínez 2004: 84; Torres-Martínez *et al.* 2013: 23; Torres-Martínez *et al.* 2016: 366).

The north-western gate possessed a defensive tower that dominated a sharpely-angled ramp that passed between two parallel wall sections. Flanking this access route on are the remains of a substantial ditch, most probably constructed during the Late Iron Age. The ditch is triangular in cross section, some 4 to 5 meters wide and 2 meters deep. The interior of the ditch is lined with stones embedded into a yellowish clayey soil, which may have served as a mount for *cervi* type wooden stakes. The northern gate was narrow, more of a sally port or postern. Apparently, it did not possess a tower; its defensive features were marked by a long narrow corridor between two parallel wall faces. The southern gate is accessed by a long ramp that ascends from the lower southern terraces. This ramp was constructed on a foundation of dressed limestone blocks and provides a relatively gentle slope for anyone wishing to gain access from the agricultural plateau to the south and southeast of the hilltop. At present, there are no obvious remains of a fortified tower protecting the southern gateway, but it may have in fact possessed one.

The southern plateau and lower terraces of Monte Bernorio are enclosed within a complex multivallate system of discontinuous large concentric earthworks that increase the *oppidum*'s occupied area to 90 ha earthwork defenses are clearly distinguished in aerial photographs and LiDAR images (Figure 3). On the ground, large sections remain well enough preserved to permit close inspection. Recent excavation of one of the earthworks confirms the Late Iron Age construction, which likely happened in association with the construction of the ditch on the summit. The ends of the discontinuous earthworks are slightly curved (Torres-Martínez *et al.* 2016: 368). In some sections, these earthworks measure just over two meters in thickness at the base and nearly two meters in height. The size and complexity of this defensive system would have required a great investment in collective labor and materials for its construction. This type of earthwork defense has been documented at other locations in northern Spain, although on a smaller scale (Camino 1995: 158-165; Torres-Martínez 2011: 289-292). Inside the outer earthworks, all along the northern side of the hill and around to the south of Monte Bernorio, are a series of springs. There is no water source within the Acropolis of the *oppidum*. All water used by the inhabitants came from these springs.

Across the plateau, some three kilometers to the south, on the plain of La Lastra (Pomar de Valdivia, Province of Palencia), is located the Roman camp (*castra*) of El Castillejo (Figure 4). Between 2000 and 2002, surveys and targeted excavation trenches were carried out at El Castillejo by the Instituto de Estudios Prerromanos y de la Antigüedad (IEPA) under the direction of Eduardo Peralta Labrador. IEPA identified a large irregularly shaped Roman camp

(*castra maiorem)* taking in over 41 ha. The core of the site was occupied by central seasonal camp (*castra aestiva*), of traditional rectangular plan 18 ha in size. This camp was surrounded by a *vallum* (palisade) consisting of *agger* earthworks and stones with *fossa fastigiata*. Other structures were constructed to conform to the shape of the plateau, giving the outer camp its irregular plan. These outer fortifications took advantage of the natural steep slopes and cliffs of the plateau. More open areas were reinforced with a stone *agger*, most likely with a *vallum*, a *fossa duplex* (double ditch) and a *contra agger*. The fortified main entrance to the camp was located on the side of the plateau facing Monte Bernorio. Although of irregular plan, the proportions of the features of the camp are consistent with those cited in Pseudo-Hyginius (*De munitionbus castrorum* XLIX) and Vegetius (mil. I, 24). The camp could probably have accommodated two complete legions with accompanying auxilliaries. Finds recovered from El Castillejo include pieces of military equipment (*caligae* nails, triple-bladed arrowheads, a *pilum* fragment), fragments of military dress (an *aucissa* type brooch), tools, tent pole fragments, and more importantly coins that date the camp to the Early Principate of Augustus. Just as important, is the realization that these finds are consistent with Roman finds recovered from Monte Bernorio and the plateau in between. This indicates, quite clearly, that the Roman assault undertaken at Monte Bernorio originated from this camp (Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 529-530; Peralta Labrador 2003: 280-282, 301-306).

6. KOCOA Analysis at Monte Bernorio

(Figure 5)

Objectives

In the absence of explicit documentation, the objectives of the two combatants must be inferred; however, in this case it should be safe to do so. The overall Roman strategic objective was the conquest and pacification of the provinces of Cantabria and Asturia through the elimination of their ability and willingness to make war (Florus 2.33.47; Orosius 6.21.3). Achievement of this objective required a series of operations aimed at the reduction of their strongholds and defeat of their armies in battle. The reduction of the Cantabrian *oppidum* at Monte Bernorio and the elimination of its warriors were the tactical objectives that needed to be achieved as a step toward the fulfilment of the overall strategic objective. By contrast, the Cantabrian overall strategic objective was to remain a free people by defeating the armies of

Rome. At Monte Bernorio, the Cantabrian tactical objective was simply to successfully defend their main settlement.

Key Terrain

Key Terrain is "any locality or area the seizure, retention, or control of which affords a marked advantage to either combatant (U.S. Army 1994: 2-17)". Key Terrain is often selected for use as battle positions or objectives and "may be enemy oriented", meaning that if the enemy controls the terrain it could prevent the accomplishment of mission objectives (ROTC 2002b: 197; U.S. Army 2007: 5-12). "You identify key terrain starting at the objective or main battle area and working backward to your current position (ROTC 2002b: 197; U.S. Army 2007: 5-12)."

Acropolis: The Acropolis was the ultimate objective for both the Romans and the Cantabrians. As the Roman objective was the reduction of the Monte Bernorio *oppidum* as a Cantabrian stronghold, along with the elimination of the military capabilities of its inhabitants, securing and occupation of the Acropolis represented the successful achievement of the objective. To the Romans would accrue all the strategic benefits possessed by the Monte Benorio *oppidum*. The Romans did in fact occupy the site immediately following the destruction of the *oppidum* by building a *castellum* within the northern area of the acropolis. For the Cantabrians, the opposite was true. As long as they controlled the acropolis, they maintained a hope of retaining Monte Benorio. The rampart and gates will be discussed under 'Obstacles' below. Excavations within the acropolis revealed a relatively dense settlement of rectangular and sub-retangular houses with intervening spaces or streets (Torres-Martínez 2004: 80, 89-92). The structures in this area would have functioned as rudimentary obstacles, as fighting in this area would devolve into a sort of urban warfare. The excavations in this area did recover Roman arrow heads, suggesting that fighting did in fact take place in the acropolis, and may represent the end of Cantabrian defence of Monte Benorio (Torres-Martínez 2004: 88). Excavations further revealed that the end of the indigenous occupation of the *oppidum* is marked by a massive fire that destroyed the settlement. The fire is characterized by a pronounced ash-colored horizon containing burned wood, charcoal and destruction debris (Torres-Martínez, 2004: 91; Torres-Martínez *et al.* 2016: 370).

Springs: The freshwater springs located along Monte Bernorio's northern perimeter and southern tip were, in effect, the *oppidum*'s Achilles Heel. There was no natural source of potable water within the Acropolis; all water consumed by the inhabitants was obtained from

these springs. It is not known whether or not the Romans were aware of the location of these springs or of their importance to the *oppidum*. For the Cantabrians, however, access to these springs was critical. If the Romans occupied, or otherwise denied the use of these springs, the Cantabrians would be forced to rely upon whatever water they had managed to store within the Acropolis of the *oppidum*. Monte Bernorio would quickly become untenable, perhaps in a matter of days. It was therefore essential that the Cantabrians defend them. It is likely that they chose to meet the Roman army in the open field between the *oppidum* and the Roman camp at El Castillejo, or chose to fight among the multivallate earthworks on that side.

Outer Earthworks: The outer earthwork fortifications will be discussed under 'Obstacles' below. They are included here as Key Terrain due to the defensive advantages they conveyed to both combatants. For the Cantabrians, either falling back from the open field or in initial deployment, the outer earthworks provided cover from Roman missile fire. More importantly, these defences forced Roman attackers to conform to a certain range of behaviors and approaches to the Acropolis of the *oppidum*. In the case of the Romans, the outer earthworks were an objective that needed to be secured to permit approach to, or siege of, the Acropolis. Once secure, the earthworks likely provided some concealment from Cantabrians deployed along the rampart encircling the Acropolis.

Observation-Fields of Fire

Areas around Key Terrain, Objectives, Avenues of Approach, and Obstacles are analyzed to determine if they provide clear Observation and Fields of Fire for both friend and enemy forces (ROTC 2002b: 189; U.S. Army 2007: 5-12). Observation is the ability to see the threat visually or through the aide of surveillance devices, including scouts or forward observers (U.S. Army 1994: 2-10). A field of fire is the area that a weapon or group of weapons may effectively cover with fire from a given position (U.S. Army 1994: 2-10). Fire may be either direct or indirect. In ancient warfare, a soldier could generally see farther than a projectile could be fired. The exception would be archers or artillery firing blind over a wall or other obstacle.

Observation

Acropolis: The summit of Monte Bernorio offers unobstructed direct line of sight for several kilometers throughout a full 360º viewshed. This viewshed is one of the critical elements comprising the strategic importance of Monte Bernorio. The Roman camp at El Castillejo is

fully within view (Figure 6). Except for a small area of slightly lower elevation near to El Castillejo, the entire approach of the Roman army would be visible to watchers on the rampart. The Cantabrians would have seen the preparations and march of the Roman army as it left El Castillejo for its approach to Monte Bernorio. They would have ample warning and time in which to deploy their forces in the outer earthworks or outside on the plateau. The final dispositions of the Roman army would be clearly visible as they moved to contact. Closer at hand, the height and vertical face of the rampart wall created something of an artificial military crest that offered excellent visibility over the immediate area outside of the Acropolis. From this vantage point, Roman attackers would be fully visible moving through the outer earthworks to Cantabrian defenders manning the rampart.

Roman Camp El Castillejo: The Roman camp at El Castillejo is well situated for surveillance of Monte Benorio. Roman commanders had an unobstructed, unaided direct line of site across the plateau that was to be their avenue of approach to the southern side of Monte Bernorio (Figure 7). They could plainly see the rampart, with the southern gateway, and outer earthwork fortifications that they would have to contend with. The northern side of Monte Bernorio was masked by the mountain itself. Views to the south and west of the camp were blocked by higher terrain.

Fields of Fire

Acropolis Rampart: The maximum range of the Cantabrian javelin depended on the arm strength of the warrior throwing it. The javelin and *pilum* were closely related in form and function allowing for the estimate of the maximum effective range of the javelin to be similar at 30m (Goldsworthy 1996: 183). This means that the defenders manning the rampart wall could do little but attempt to keep attackers from the base of the wall. The gateways, however, were well within this 30m arc. Both the north-western and southern gateway were accessed by a ramp that double-backed upon itself with a tower covering its approach. Each section of the ramp was in range of the tower and there would be crowding at the gateway.

Published accounts of the excavations of the Acrópolis Rampart on the south side of Monte Bernorio record the recovery of Roman arrowheads (*sagittae*), stone projectiles and two fragments of *pila catapultari* (Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 533). The arrowheads are of particular interest. Most of them are of a pyramidal cross section,

marking them as belonging to the 'Syrian type', however there a several triple-bladed arrowheads as well. Several of the arrowheads were found embedded in the rampart wall itself, with many more recovered at its foot (Figure 8). These arrowheads link Monte Bernorio with the Roman camp at El Castillejo as well as the hillfort of La Loma (Torres-Martínez *et al.* 2016: 376-378; Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 533). Roman bows had an estimated maximum range of 230 m, but a much shorter effective range at 90 m (Goldsworthy 1996: 184). An arc of 90 m from the excavated rampart section would put the archers on the terrace below the rampart in an area known as the 'necropolis' after burials were discovered there in early excavations (Torres-Martínez 2004: 80).

A number of small calibre stone projectiles were recovered from the destruction levels around the rampart and southern gate. These stones were coarsely worked into a spherical shape with diameters between 4 and 5 cm They range in weight between 102 g and 134 g, which is roughly equivalent to one quarter of a Roman *mina* (Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 533). The discovery of rounded river stones used in the defence of the rampart is interesting. In terms of assessing fields of fire for such a weapon, the range would extend only as far as a Cantabrian warrior could throw such a projectile. This range would be variable based upon the weight of the individual stones, however this could not have been effective over an extended distance from the rampart. Up close, however, large stones would be an effective means of clearing attackers from scaling the rampart wall on ladders.

Two iron projectile heads, likely from bolts fired by a *scorpio* were also recovered, as were two additional smaller iron projectile heads. The larger heads are square in cross section, tapering to a sharp point, and with a long tang for attachment to the shaft. They measured 8.8 cm in length by 0.7 cm in width and 7.1 cm by 0.8 cm respectively (Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 533). Marsden (1969: 89) mentions that different sized *scorpio* had different ranges, but only lists a 700 yards range for a three span machine. This would put the shooter beyond the outer earthworks in this area. The smaller projectiles are interpreted as coming from a *cheirobalistra* or *manubalista*. The heads are multi-sided and hexagonal in cross section, measuring 5 cm long. Both tips were blunted by impact (Torres-Martínez, Martínez Velasco and Pérez Farraces 2012: 533). The maximum ranges achieved depended upon the degree of aim with a maximum range of 421 m at 15º elevation (Rossi *et al.* 2015: 85). Effective range is not given, but presumably is one half (192.5 m) to one third (128.33 m) that distance. This is similar to the maximum effective range of 185 to 200 meters estimated by Wilkins (1995: 54). Marsden (1971: 233) claims only a maximum range of only

150 yards (137.06 m). If these effective estimates are accurate, that would likely place the shooters within the necropolis or on the next terrace further down.

The Roman army deployed a varied set of light field artillery to bear against the rampart wall on the south side of the acropolis. Their intent could not have been to breach the wall with these weapons, as they lacked the size and power. Rather, these machines likely functioned like smaller field artillery used by later armies, primarily as anti-personnel weapons. Their use here was most likely as cover fire for an assault upon the rampart with scaling ladders in tandem with an attack upon the southern gate. We infer from the lack of evidence for formal siege operations that the assault was successful.

Outer Earthworks: There are, as yet, no finds of projectile points from the outer earthworks, which could be largely due to the lack of research in this area. Much of the intervening area between the rows of earthworks could be covered by Cantabrians with javelins positioned on top the walls. Romans could have used *pila* with good effect, as well as archers. The Cantabrians could reach 30 m effectively out into the open plateau from the outermost earthwork. The Romans could have used covering fire from the plateau during an approach to the earthworks.

Cover and Concealment

Cover is defined as "protection from the effects of direct and indirect fires (U.S. Army 1994: 2-11)". Concealment is "protection from observation (U.S. Army 1994: 2-11)". Concealment does not provide protection from direct or indirect fire, it only masks visibility (ROTC 2002a: 255). There was no cover or concealment on the open plateau between Monte Bernorio and El Castillejo. The plateau is open grasslands with no tree or shrubbery cover and likely resembles its appearance at the time of the Cantabrian Wars.

Acropolis Rampart / Acropolis Structures: The Acropolis Rampart offered excellent cover from direct missile fire for those taking shelter directly behind it. Those manning the top of the wall had slightly less protection. The Acropolis Rampart likewise concealed the disposition and movements of troops directly behind it. The wall completely obstructs the line of sight of any attacker approaching from the lower terraces. Observation points further back on the lower terraces and plateaus, or even kilometers back at El Castillejo may have been able to see some dispositions and movements taking place higher on the slope behind the rampart, but the view

would have been at least partially obstructed by houses or other structures. However, there was a shadow effect caused by the height of the rampart wall that would block the line of sight to the sector directly behind it. The structures within the Acropolis offered similar cover and concealment if on a smaller scale. Once the rampart was breached, these structures would break up line of sight, reducing the effectiveness of missile weapons, but presumably fighting that took place within the Acropolis would be primarily hand-to-hand combat.

Earthworks: In terms of cover and concealment, the outer earthworks functioned in the same fashion as the Acropolis Rampart. Cantabrian warriors behind the earthworks were protected from direct missile fire coming from attackers on the plateau. Indirect missile fire arcing over the earthworks would inflict some casualties, however. The open ends of the discontinuous lines of earthworks would make any defenders sheltering behind them vulnerable to direct missile fire from attackers who managed to take up position astride the openings. Defenders on top of the earthworks would more exposed, but may have had the benefit of a palisade or *cervi* stakes to provide additional cover. As long as the earthworks remained in the control of the defenders, movements behind them would be completely screened from observation from an attacker on the plateau except when moving through or behind the openings.

Obstacles

Obstacles are any natural or manmade terrain features that stop, impede, or divert military movement (U.S. Army 1994: 2-14). There are two kinds of obstacles: 'existing' and 'reinforcing'. 'Existing' obstacles are natural obstacles or obstacles that are considered permanent. Buildings, rivers, creeks, stonewalls, hedgerows, depressions, and the like are considered 'existing obstacles'. 'Reinforcing' obstacles are generally manmade obstacles that are typically used to augment 'existing' obstacles. These include minefields, booby traps, abatis, barbed-wire, downed trees, and so on (ROTC 2002a: 253; 2002b: 192; U.S. Army 2007:5-10).

Obstacles are further classified into four categories (Figure 9), based upon their tactical purposes, or the behavior they are intended to force upon an attacker: 'disrupt,' 'turn,' 'fix,' or 'block'. 'Disrupting' obstacles are used to break up enemy fortifications and tempo, throw off their timetable, make them commit breaching assets prematurely, and cause them to launch their attack piecemeal (ROTC 2002b: 194). A 'Turning' Obstacle is one which forces an

attacker to deviate from their current avenue of approach onto an avenue of approach of the defender's choosing (ROTC 2002b: 194). 'Turning' Obstacles expose the attacker's flank to defensive fire or attack and funnel the attackers into an engagement area or kill zone. 'Fixing' Obstacles prevent an enemy from moving any part of his force from a particular location for a particular period. 'Blocking' Obstacles act to deny the enemy access to an area or prevent advance along a particular direction or avenue of approach.

Earthworks: The outer earthworks encircling the lower terraces of Monte Bernorio share the characteristics of several types of obstacles, but are most correctly identified as an existing disruptive obstacle for purposes of KOCOA. The multiple openings, irregularly spaced along the several circuits of earthworks, meant that without substantial gate fortifications, they could not have acted as blocking obstacles. Although the flanks of attackers moving between the earthworks were vulnerable to missile fire from the tops, the irregularly spaced openings were seemingly not designed to lead attackers into a prearranged kill zone or fix them in place for a certain length of time. The function of these earthworks then was to disrupt or break up an attacker's linear formations. An attacker would be forced to storm each ring of earthworks in turn, change formation in order to fight along the pathways through them, or a combination of the two.

Acropolis Rampart: The Acropolis rampart and associated ditch was clearly intended to function as a blocking obstacle by keeping potential assailants out. Normal travel to and from the Acropolis was controlled through the three gateways described above. In the event of attack, these gates would have been shut, barred and defended. In the absence of large siege engines, the only methods available to breach the rampart was an assault on the wall using scaling ladders and/or an assault on a gate using a small covered ram or *testudo* formation.

Avenues of Approach

An Avenue of Approach is "an air or ground route of an attacking force of a given size leading to its objective or to key terrain in its path (U.S. Army 1994: 2-18)". The identification of Avenues of Approach is critical because all manoeuvre is dependent upon them.

From Roman Camp El Castillejo: The Roman line of march from their camp at El Castillejo across the plain to Monte Benorio was unrestricted across open ground until encountering Cantabrian warriors on the plain or manning the outer ring of earthwork fortifications (Figure

10). From that point, their avenue of approach into the acropolis at the summit of Monte Benorio would have been severely restricted by the earthworks and the acropolis rampart fortification. The earthwork fortifications were discontinuous, their open ends allowing passage to the southern gate and acropolis rampart. The acropolis rampart would have blocked approach to the interior of the site, and would have necessitated either scaling of the rampart with ladders or breaching the gateway, possibly using a *Testudo* formation or fire. Once inside the rampart, attackers would have had to negotiate the homes and structures of the settlement. Any surviving Cantabrians that managed to escape would likely have fled north, away from the Roman avenue of approach.

7. Conclusion

The KOCOA analysis of Monte Bernorio was carried out over a three-week period in August 2016, utilizing aerial photographs and field walking. The analysis did not reveal evidence of a formal or protracted siege of Monte Bernorio. The classic elements of a complex Roman siege, as chronicled at sites such as *Alesia* in Gaul (52 BC) (Reddé *et al.* 1995) and the Spanish hillfort at La Loma (a site interpreted as belonging to the same campaign as Monte Bernorio, see Peralta Labrador 2015), are absent. There are, as yet, no obvious traces of fortifications indicative of Roman circumvallation of Bernorio Mountain. The outer earthworks remain in a relatively good state of preservation, aside from natural erosion and relatively recent destruction in one section to facilitate agriculture. The ditch feature was not filled in antiquity to permit the approach of large siege engines. El Castillejo remains the only Roman encampment to be identified in association with Monte Bernorio to date. It appears that Monte Bernorio bares more of a resemblance to Caesar's (*Civil War* 3.80) '*repentina oppugnatio*' (violent assault) on Gomphi (48 BC) in Greece, than it does to the more well-known Roman sieges.

The KOCOA analysis suggests that an attack on the Cantabrian *oppidum* of Monte Bernorio originated from the Roman encampment at El Castillejo, an attack that likely consisted of the equivalent of two full legions with associated auxiliaries, an estimated 15,000 men. The objective of the attack was the reduction of Monte Bernorio as a stronghold along with the elimination of its warriors as a military force. The Romans likely marched across the intervening plain to within a kilometer or so of the outer earthworks, where they were met by a Cantabrian army of unknown size. The Cantabrians were probably forced to meet the Romans

outside their main defensive fortification at the acropolis due to the need to protect the only available water source on the northern edge of the plateau. A battle took place in which the Romans prevailed. Cantabrian survivors may have attempted to withdraw through the outer earthworks and into the acropolis or may have attempted to leave the battlefield by withdrawing to the north. The Romans may have regrouped and prepared for an assault upon the acropolis, preparatory to opening formal siege operations. The assault was aimed at the southern gateway and rampart, using cover fire from field artillery in support of an attempt with scaling ladders and possibly a *testudo* type assault upon the southern gate. This assault, or a similar follow up assault, succeeded and fighting continued within the acropolis itself. The Roman army succeeded in obtaining their objective as any Cantabrians who managed to escape most probably fled north away from the Roman line of advance. This proposed hypothesis is supported by ongoing archaeological excavations.

When used as the military does, with knowledge of the military doctrines of the combatants and representations of the terrain as close to the time of battle as possible, KOCOA terrain analysis shows promise as a locational and analytical tool for assessing how terrain features influenced battle. KOCOA can provide a predictive model of what likely happened that can then be tested against the archaeological and historical record. As a codified analytical concept, KOCOA is transferable among researchers and site categories making it an excellent tool for conflict archaeology. KOCOA has been used for a number of years in the United States on historical battlefields, but as is demonstrated by the Roman attack on Monte Bernorio it is applicable to prehistoric and early historic battles as well.

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Figure Captions

Figure 1. Theatre of military operations during the *Bellum Cantabricum et Asturicum* (Map drawn by IMBEAC Bernorio Project Team & A. Martínez-Velasco).

Table 1: KOCOA Terrain Analysis Summary Definitions (C. J. Brown).

Fig. 2: Upper wall and ditch of the *oppidum* of Monte Bernorio (IMBEAC; design D. Vacas).

Fig. 3: Multivallate earthworks enclosing an area of 90 hectares with location of springs (IMBEAC, design A. Martínez-Velasco).

Fig. 4: Figure 4. Location and plan of the Roman military camp of ‘El Castillejo’ (IMBEAC, design A. Martínez-Velasco & M. Galeano Prados).

Fig. 5: Aerial photograph of Monte Bernorio with KOCOA features (Photo: Visor SigPac V3.3 modified by IMBEAC).

Fig. 6: View of the Roman Camp at El Castillejo from Observation Point in Monte Benorio Acropolis (Photo: C. J. Brown).

Fig. 7: View of Monte Bernorio from Observation Point in Roman Camp at El Castillejo (Photo: M. Fernández-Götz).

Fig. 8: Selection of Roman projectiles found at Monte Bernorio: 1–13 arrowheads (*sagittae*); 14–17 *pila catapultaria*; 18–20 stone projectiles (*ballistae*) (Drawings by IMBEAC Bernorio Project Team & design A. Martínez-Velasco).

Fig. 9: Obstacle Effects (Drawing from ROTC 2002a).

Fig. 10: Photo of the terrain encountered by Roman soldiers in their advance on Monte Bernorio (Photo: C. J. Brown).